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(54) Body fluid-absorbing article.

(57) A body fluid-absorbing article such as for example a disposable diaper is provided with at least one absorbent member comprising 50 to 99% by weight of a fibrous material and 50 to 1% by weight of an absorbent polymer which absorbent member contains at least one compound (A) selected from (i) sulphur containing reducing agents (ii) antioxidants and (iii) oxidizing agents. By the action of the compound (A) the swelled gel of the absorbent polymer formed in consequence of absorption of body fluid is prevented from deteriorating or being decomposed by aging.

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Description

BODY FLUID-ABSORBING ARTICLE

This invention relates to a body fluid-absorbing article using a specific absorbent member containing an absorbent polymer. More particularly, it relates to a body fluid-absorbing article possessing noticeably improved absorption properties such that even after absorption of body fluid, the absorbed body fluid is stably retained for a long time therein without leaking out sideways.

As absorbent members for such body fluid-absorbing articles as disposable diapers, sanitary napkins, and sweat-absorbing pads, the products obtained by combining such fibrous materials as cotton, pulp, and paper with absorbent polymers as disclosed in U S Patent Nos. 3,669,103; 3,670,731; 4,102,340; 4 364,992; and 4,610,678 have been in popular use in recent years. From the standpoint of ensuring ease of carriage and comfort of wear, the tendency is for these absorbent articles to be reduced in size. In the circumstances, absorbent articles which incorporate therein absorbent polymers in increasingly large proportions have been appearing in increasing volumes in the market.

In the conventional body fluid-absorbing articles which use absorbent members incorporating therein absorbent polymers, however, no due attention has been paid to the prevention of absorbent polymers used therein from deteriorating and decomposing by the action of the absorbed body fluid, though numerous uniquely devised constructions have been proposed for use in such body fluid-absorbing articles as disclosd in the aforementioned patent publications When they absorb such body fluids as urine, menstrual blood and sweat, the swelled gel of the absorbent polymer in the absorbent member gradually deteriorates and decomposes even to a point where the absorbent member is no longer able to retain the absorbed body fluid stably and prevent sideways leakage of the body fluid, often with the result that the leaking body fluid will smear bedclothes and clothing.

As means of preventing the absorbent polymer from being deteriorated and decomposed by the absorbed body fluid U S Patent No 4 666,975 for example, has proposed a method for improving the stability of the swelled gel by allowing the particles of the absorbent polymer to assume an increased cross-linking density in the surface region thereof The absorbent polymer obtained by this method, however, suffers inevitably from a decrease in the capacity thereof for holding the absorbed body fluid. Thus, the absorbent polymer has found utility in absorbent members for body fluid-absorbing articles only with difficulty

As described above the conventional body fluid-absorbing articles have posed a problem in the sense that the ability of the absorbent member to retain the absorbed body fluid is degraded with lapse of time even to a point where sideways leakage of the absorbed body fluid becomes inevitable In the circumstances, the desirability of developing a body fluid-absorbing article of improved absorption properties incorporating therein an absorbent polymer-containing absorbent member which is good at retaining the absorbed body fluid stably for a long time has been finding growing recognition

An object of the present invention, therefore, is to provide a novel body fluid-absorbing article

Another object of this invention is to provide a body fluid-absorbing article of improved absorption properties incorporating therein an absorbent member which is good at retaining the absorbed body fluid for a long time

The objects described above are accomplished by a body fluid-absorbing article which is provided with at least one absorbent member comprising 50 to 99% by weight of a fibrous material and 50 to 1% by weight of an absorbent polymer, which absorbent member contains at least one compound (A) selected from sulphur-containing reducing agents, antioxidants and oxidizing agents

As the result of our study, we have found that, after the body fluid-absorbing article has absorbed the body fluid the aforementioned compound (A) is capable of preventing or hindering the swelled gel of the absorbent polymer from deteriorating or decomposing with lapse of time

In this invention, the absorbent polymer as a component of the body fluid absorbent member has such a nature that, on immersion in water it will absorb a large volume of water and swell and consequently form a substantially water-insoluble hydrogel As typical examples of the absorbent polymer of this description, there can be cited hydrolyzed starch-acrylonitrile graft polymer, partially neutralized starch-acrylic acid graft polymer saponified vinyl acetate-acrylic ester copolymer, hydrolyzates of acrylonitorile copolymers, cross linked hydrolyzates of acrylonitrile copolymers hydrolyzates of acrylamide copolymers, cross-linked hydrolyzates of acrylamide copolymers partially neutralized polyacrylic acid cross-linked partially neutralized polyacrylic acid and isobutylene-maleic anhydride copolymer

These absorbent polymers in themselves are known in the art They are disclosed as in U S Patnet Nos 4 286 082 3,661 815 4 076,663 and 4 683 274, Japanese Patent Laid-Open SHO 52(1977)-14,689, and Japanese Patent Publication SHO 53(1978)-15,959

Examples of the fibrous material which is one of the components of the body fluid absorbent member include such synthetic fibres as polyamide, polyacrylonitrile, polyester, and polyolefins and such cellulosic fibres as cotton rayon and pulp In the absorbent member, this fibrous material is used in the form of long-staple fibres or short-staple fibres or in the form of sheet such as paper, non-woven fabric, woven fabric, or knit fabric which is obtained by interlacing such fibres Among other fibrous materials cited above cellulosic fibres are used most advantageouy from the standpoint of the absorption properties of the absorbent member to be eventually produced From the standpoint of ease of handling during the course of the

fabrication of the absorbent member, use of ground pulp, ground pulp sheet, or tissue paper proves to be desirable.

The sulphur-containing reducing agent which is used as the compound (A) to be contained in the body fluid absorbent member of the present invention is not specifically restricted so long as it is a sulphur compound capable of the reaction of reduction. Examples of the sulphur-containing reducing agent include sulphides such as ammonium sulphide, sodium sulphide, potassium sulphide, and lithium sulphide; hydrosulphides such as sodium hydrosulphide; sulphur oxide compounds such as thiosulphates represented by sodium thiosulphate and potassium thiosulphate, sulphurous acid, sulphites represented by sodium sulphite and potassium sulphite, hydrogen sulphites represented by sodium hydrogen sulphite and potassium hydrogen sulphite, and dithionites represented by hydrosulphite, and mercaptans such as mercaptoethanol, cysteine, and alkyl mercaptans represented by methyl mercaptan, ethyl mercaptan, propyl mercaptan and butyl mercaptan.

The antioxidant to be used as the compound (A) in the present invention is not specifically restricted. Examples of the antioxidant include water-soluble antioxidants such as citric acid, pyrogallol, 1,1-bis(4-hydroxyphenol)-cyclohexane, hydroquinone, β-naphthol, and ethyl gallate; phenol type antioxidants such as 2,6-di-t-butyl-p-cresol and butylated hydroxyanisol; sulphur-containing antioxidants such as thiourea dioxide and dilauryl thiodipropionate; and phosphorus-containing antioxidants such as triphenyl phosphite.

Examples of the oxidizing agent to be used as the compound (A) in the present invention include peroxides such as hydrogen peroxide, sodium peroxide, and barium peroxide; halogens such as fluorine, chlorine, bromine, and iodine; metal salts such as ferric chloride, cupric sulphate cupric chloride, cupric acetate, and lead (II) acetate; metal oxides such as potassium permanganate, potassium chromate, potassium dichromate, and osmium tetraoxide; halogen oxides such as sodium hypochlorite, potassium hypochlorite, sodium chlorite, chlorine dioxide, chloramine T, bleaching powder, perchloric acid, sodium perchlorate, periodic acid, sodium periodate, and potassium periodate; and quinones such as p-benzoquinone.

Among the examples of the compound (A) cited above, sulphur-containing reducing agents which are highly effective in preventing the swelled gel of the absorbent polymer formed by absorption of body fluid from being deteriorated with time prove to be particularly desirable.

In the present invention, the compound (A) is desired to be contained in the body fluid absorbent member in an amount in the range of 0.05 to 20 parts by weight, preferably 0.1 to 10 parts by weight, based on 100 parts by weight of the absorbent polymer. If the amount of the compound (A) is less than 0.05 part by weight, it may not be enough for the compound (A) to manifest any substantial effect in preventing the swelled gel of the absorbent polymer from being deteriorated with time. If the amount exceeds 20 parts by weight, the excess does not produce any proportionate addition to the effect but rather goes to decreasing the capacity of the absorbent member for absorbing the body fluid. Any deviation from the aforementioned range may be tolerated but is not desirable.

A body fluid-absorbing article of the present invention may be formed by incorporating the aforementioned compound (A) in at least one body fluid absorbent member which consists of 50 to 99% by weight, preferably 60 to 90% by weight, of a fibrous material and 50 to 1% by weight, preferably 40 to 10% by weight, of an absorbent polymer. Neither the shape of the absorbent member nor the condition of distribution of the components in the absorbent member is critical for a body fluid-absorbing article of the present invention. It can be produced therefore, by using any of the conventional methods adaptable for the fabrication of an absorbent polymer in an absorbent member prepared in any form such as sheet or film which is convenient for the manufacture of a body fluid-adsorbing article such as, for example, disposable diaper, sanitary napkin, or sweat pad. To be specific, the absorbent member can be obtained by having an absorbent polymer nipped between sheets of fibrous material or by mixing an absorbent polymer with ground fibrous material and subsequently molding the resultant mixture in the form of a sheet.

The means employed for the incorporation of the compound (A) in the absorbent member is not specifically restricted so long as it is capable of depositing the compound (A), preferably uniformly, in the absorbent member lest it should fall off the absorbent member. For example, this incorporation may be accomplished during the course of the manufacture of the absorbent member by simply adding the compound (A) to either of the absorbent polymer and the fibrous material such as paper or pulp which are the components of the absorbent member. This addition of the compound (A) can be attained by directly adding the compound (A) in its unmodified powdery form or by dissolving or dispersing the compound (A) in a suitable vehicle such as water or an organic solvent, spraying the resultant liquid preparation on the absorbent member or impregnating the absorbent member with the liquid preparation, and drying the wet absorbent member, when necessary, to expel the vehicle.

Examples of the method for the incorporation of the compound (A) in the body fluid-absorbent member are as follows.

(1) A method which causes the compound (A) to be incorporated in the absorbent member after the pattern of sandwich by preparing a mixture of an absorbent polymer with the compound (A) in a powdered form and having the mixture interposed in the form of layer between at least two sheets of the fibrous material as a sandwich.

(2) A method which causes the compound (A) to be homogeneously incorporated throughout the absorbent member by preparing a mixture of the absorbent polymer, the compound (A) in a powdered form, and short-staple fibres as a fibrous material and air moulding the mixture in the form of sheet.

(3) A method which causes the compound (A) to be contained in layers in the absorbent member by spraying a solution or dispersion of the compound (A) on the absorbent polymer then drying the wet absorbent polymer, when necessary, thereby producing a composite having the compound (A) deposited on the absorbent polymer, and then having this composite interposed between at least two sheets of the fibrous material as a sandwich.

(4) A method which causes the compound (A) to be uniformly contained in the absorbent member by spraying a solution or dispersion of the compound (A) on the absorbent polymer, then drying the wet absorbent polymer, when necessary, thereby producing a composite having the compound (A) deposited on the absorbent polymer, mixing the composite with short-staple fibres as the fibrous material, and air laying the resultant mixture in the form of sheet.

(5) A method which causes the compound(A) to be contained in layers in the absorbent member by spraying a solution or dispersion of the compound (A) on at least one sheet of the fibrous material, then drying the wet sheet, when necessary, thereby producing sheet of the fibrous material having the compound (A) deposited thereon and having the absorbent polymer interposed between the sheet of the fibrous material as a sandwich

(6) A method which causes the compound (A) to be uniformly contained in the absorbent member by spraying a solution or dispersion of the compound (A) on short-staple fibres as the fibrous material, drying the wet short-staple fibres, when necessary, thereby producing a composite having the compound (A) on the short-staple fibres, mixing this composite with the absorbent polymer, and air moulding the resultant mixture in the form of sheet.

(7) A method which causes the compound (A) to be contained in layers in the absorbent member by immersing at least two sheets of the fibrous material in a solution or dispersion of the compound (A), then drying the wet sheets, when necessary, thereby allowing the compound (A) to be deposited on the sheets, and having the absorbent polymer interposed between the two sheets of the fibrous material after the pattern of a sandwich

In all the conceivable solutions of the compound (A), the aqueous solution proves to be particularly desirable from the standpoint of ease of the handling. In all the conceivable sheets of fibrous material, the sheet of ground pulp and the tissue paper prove to be particularly desirable. Among other possible forms of short-staple fibres, the ground pulp proves to be desirable.

The production of the body fluid-absorbing article of the present invention from the body fluid absorbent member which is obtained as described above is accomplished by suitably fabricating the absorbent member all by itself or by suitably combining the absorbent member with other components so as to meet the purpose for which the body fluid-absorbing article will be used. To be used as a pad for the absorption of sweat, for example, the body fluid-absorbing article can be obtained simply by placing the absorbent member as obtained on a mat. To be used as a disposable diaper or sanitary napkin, the body fluid-absorbing article can be obtained by having the absorbent member as obtained interposed between a liquid-pervious top sheet and a liquid-impervious back sheet.

The body fluid-absorbing article of the present invention produces the effect thereof particularly advantageously when it is used as a disposable diaper which is destined to remain for a long time in contact with urine, i.e. a body fluid discharged in a large volume and suffered to induce the phenomena of deterioration and decomposition of the swelled gel of the absorbent polymer particularly conspicuously.

The body fluid-absorbing article of the present invention can be used efficiently as disposable diaper, sanitary napkin or sweat pad because the absorbent polymer-containing absorbent member neither tends to permit gradual deterioration of the ability thereof to hold the absorbed body fluid nor tends to suffer from sideways leakage of the absorbed body fluid.

Further in the body fluid-absorbing article of the present invention, since the deterioration and decomposition of the absorbent polymer is well curbed even after the absorption of the body fluid owing to the action of the compound (A) contained in the absorbent member, the proportion of the absorbent polymer in the absorbent member can be increased. The present invention, therefore, permits provision of a body fluid-absorbing article which is compact, convenient for carriage, comfortable to wear, and has good absorbency.

Now, the present invention will be described more specifically below with reference to working examples. It should be noted, however, that the present invention is not limited to these examples. Wherever parts and percents (%) are mentioned in the following examples, they are meant to refer to parts by weight and percents (%) by weight unless otherwise specified.

Example 1

A granular absorbent (1) was obtained by mixing 100 parts of an absorbent polymer composed mainly of a cross-linked partially neutralized polyacrylic acid (produced by Nippon Shokubai Kagaku Kogyo Co., Ltd. and marketed under trademark designation of "AQUALIC CA") by spraying with 1 parts of an aqueous 20% sodium thiosulphate solution.

Then, 1.5g of the absorbent (1) was uniformly spread between two sheets of ground pulp 190 mm × 140 mm in area (having a basis weight of 50 g/m^2 and a density of 0.1 g/cm^3) after the pattern of sandwich, to produce an absorbent member. This absorbent member was interposed between one polyethylene film and one polypropylene spun bond non-woven fabric, to produce a body fluid-absorbing article (1) according with the

present invention.

Onto the central part of the body fluid-absorbing article (1) on the non-woven fabric side, 60g of adult human urine was poured to be absorbed by the article (1). The body fluid-absorbing article (1) was left standing for 8 hours. After the standing, 10 paper towels 23 cm × 23 cm in area were piled up on the non-woven fabric side of the article (1) and kept pressed under 40 g/cm² for 1 minute. The paper towels were weighed to determine the amount of the portion of adult human urine absorbed by the paper towels from the article (1). The swelled gel in the article (1) was visually examined to rate the degree of deterioration of the absorbent polymer on the three-point (○ - △ - ×) scale. The results are shown in Table 1.

Control 1

A body fluid-absorbing article (1) for comparison was obtained by following the procedure of Example 1, excepting 1.5 g of the same absorbent polymer (a product marketed under trademark designation of "AQUALIC CA") as used in Example 1 was used in the place of the same amount of the absorbent (1) of Example 1.

The body fluid-absorbing article (1) for comparison obtained as described above was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 2

An absorbent (2) was obtained by mixing 100 parts of an absorbent polymer composed mainly of a partially neutralized starch-acrylic acid graft polymer (produced by Sanyo Chemical Industries Co., Ltd. and marketed under trademark designation of "Sunwet IM-1000") with 1 part of powdered sodium sulphite.

A body fluid-absorbing article (2) was obtained by following the procedure of Example 1, excepting the absorbent (2) was used in the place of the absorbent (1) of Example 1.

The body fluid-absorbing article (2) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Control 2

A body fluid-absorbing article (2) for comparison was obtained by following the procedure of Example 1, excepting 1.5 g of the same absorbent polymer (a product marketed under trademark designation of "Sunwet IM-1000") as used in Example 2 was used in the place of 1.5 g of the absorbent (1) of Example 1.

The body fluid-absorbing article (2) for comparison was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 3

A powdery absorbent (3) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 1 part of mercapto ethanol by spraying.

A body fluid-absorbing article (3) was obtained by following the procedure of Example 1, excepting the absorbent (3) was used in the place of the absorbent (1) of Example 1.

The body fluid-absorbing article (3) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 4

An absorbent (4) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 0.5 part of powdery sodium hydrogen sulphite and 0.5 part of powdery pyrogallol.

A body fluid-absorbing article (4) was obtained by following the procedure of Example 1, excepting the absorbent (4) was used in the place of the absorbent (1) of Example 1.

The body fluid-absorbing article (4) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 5

A granular absorbent (5) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 0.5 part of powdery sodium sulphite and then mixing the resultant mixture with 0.5 part of an aqueous 35% hydrogen peroxide by spraying.

A body fluid-absorbing article (5) was obtained by following the procedure of Example 1, excepting the absorbent (5) was used in the place of the absorbent (1) of the Example 1.

The body fluid-absorbing article (5) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 6

A granular absorbent (6) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 5 parts of an aqueous 20% citric acid solution by spraying.

A body fluid-absorbing article (6) was obtained by following the procedure of Example 1, excepting the absorbent (6) was used in the place of the absorbent (1) of Example 1.

The body fluid-absorbing article (6) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 7

A granular absorbent (7) was obtained by mixing 100 parts of the same absorbent as used in Example 1 with 50 parts of an aqueous 3% iodine solution by spraying and drying at 80°C for 16 hours in vacuum.

A body fluid-absorbing article (7) was obtained by following the procedure of Example 1, excepting the absorbent (7) was used in the place of the absorbent (1) of Example 1.

The body fluid-absorbing article (7) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 8

Two pulp sheets (1) incorporating therein a sulfur-containing reducing agent were obtained by spraying 0.5 g of an aqueous 10% cysteine solution on two sheets of ground pulp 190 mm × 140 mm in area (having a basis weight of 150 g/m^2 and a density of 0.1 g/cm^3).

Then, 1.5 g of the same absorbent polymer as used in Example 1 was uniformly scattered between the two pulp sheets (1) after the pattern of sandwich, to produce an absorbent member. This absorbent member was interposed between one polyethylene film and one polypropylene spun-bond non-woven fabric, to produce a body fluid-absorbing article (8).

The body fluid-absorbing article (8) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 9

A body fluid-absorbing article (9) was obtained by following the procedure of Example 8, excepting 1.5g of the same absorbent (1) as used in Example 1 was used in the place of 1.5 g of the absorbent polymer of Example 8.

The body fluid-absorbing article (9) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 10

A body fluid-absorbing article (10) was obtained by following the procedure of Example 8, excepting 1.5 g of the absorbent (3) obtained in Example (3) was used in the place of 1.5 g of the absorbent polymer of Example 8.

The body fluid-absorbing article (10) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 11

Two pulp sheets (2) containing an antioxidant were obtained by spraying 1 g of a 10% ethanol solution of butylated hydroxy anisol on two sheets of ground pulp 190 mm × 140 mm in area (having a basis weight of 150 g/m^2 and a density of 0.1 g/cm^3).

Then, 1.5 g of the same absorbent polymer as used in Example 1 was uniformly scattered between the two pulp sheets (2) containing the antioxidant after the pattern of sandwich, to produce an absorbent member. A body fluid absorbing article (11) was obtained by interposing the absorbent member between one polyethylene film and one polypropylene spun-bond non-woven fabric.

The body fluid-absorbing article (11) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 12

Two oxidizing agent-containing pulp sheets (3) were obtained by spraying 0.1 g of an aqueous 10% sodium hypochlorite solution on two sheets of ground pulp 190 mm × 140 mm in area (having a basis weight of 150 g/m^2 and a density of 0.1 g/cm^3). Then 1.5 g of the same absorbent polymer as used in Example 1 was uniformly scattered between the two oxidizing agent-containing pulp sheets (3) after the pattern of sandwich to produce an absorbent member. A body fluid-absorbing article (12) was obtained by interposing the absorbent member between one polyethylene film and one polypropylene spun-bond non-woven fabric.

The body fluid-absorbing article (12) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 13

An absorbent member was obtained by mixing 1.5 g of the same absorbent polymer as used in Example 1 with 0.05 g of powdery sodium thiosulphate and 8 g of ground wood pulp fibre in a current of air, leading the resultant mixture over a wire screen of 100 mesh (having an area of 190 mm × 140 mm), air moulding the mixture by attraction toward the wire screen, and compressing the resultant sheet-like web with an embossing roller to a density of 0.07 g/cm^3.

A body fluid-absorbing article (13) was obtained by following the procedure of Example 1, excepting the absorbent member was used in the place of the absorbent member of Example 1.

The body fluid-absorbing article (13) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Example 14

A body fluid-absorbing article (14) was obtained by following the procedure of Example 13, excepting 1.5 g of the absorbent (4) obtained in Example 4 was used in the place of 1.5 g of the absorbent polymer of Example 13.

The body fluid-absorbing article (14) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 1. The results are shown in Table 1.

Table 1

	Body fluid-absorbing article	Amount of adult urine absorbed out (g)	Degree of deterioration of absorbent polymer (Note 1)
Example 1	Article (1)	1.8	○
Control 1	Article (1) for comparison	8.1	×
Example 2	Article (2)	2.7	○
Control 2	Article (2) for comparison	10.7	×
Example 3	Article (3)	1.7	○
Example 4	Article (4)	2.0	○
Example 5	Article (5)	2.1	○
Example 6	Article (6)	2.4	○
Example 7	Article (7)	2.4	○
Example 8	Article (8)	1.9	○
Example 9	Article (9)	1.6	○
Example 10	Article (10)	1.5	○
Example 11	Article (11)	2.5	○
Example 12	Article (12)	2.3	○
Example 13	Article (13)	1.5	○
Example 14	Article (14)	1.4	○

(Note 1) ○ : Perfectly retained shape of swelled gel.
△ : Partially broken shape of swelled gel.
× : Totally broken shape of swelled gel into slurry state.

Example 15

A granular absorbent (8) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 5 parts of an aqueous 20% potassium hydrogen sulfite by spraying and then drying the resultant mixture at 80° C for 30 minutes. An absorbent member was obtained by mixing 1.5 g of the absorbent (8) with 8 g of ground wood pulp fibres in a current of air, leading the resultant mixture over a wire screen of 100 mesh (having an area of 190 mm × 140 mm) and air moulding the mixture by attraction toward the wire screen and compressing the resultant sheet-like web with an embossing roller to a density of 0.07 g/cm^3. A body fluid absorbing article (15) was obtained by wrapping the absorbent member with tissue paper and interposing the wrapped absorbent member between one polyethylene film and one polypropylene spun-bond non-woven fabric.

Onto the central part of the body fluid-absorbing article (15) on the non-woven fabric side 60 g of adult human urine was poured to be absorbed by the article (15). The body fluid-absorbing article (15) was left standing for 16 hours. After the standing, 10 paper towels 23 cm × 23 cm in area were piled up on the non-woven fabric side of the article (15) and kept pressed under 40 g/cm^2 for 1 minute. The paper towels were weighed to determined the amount of the portion of adult human urine absorbed by the paper towels from the article (15). The swelled gel in the article (15) was visually examined to rate the degree of deterioration of the

absorbent polymer on the three-point (○ - △ - X) scale. The results are shown in Table 2.

Control 3

A body fluid-absorbing article (3) for comparison was obtained by following the procedure of Example 15, excepting 1.5 g of the same absorbent polymer (a product marketed under trademark designation of "AQUALICK CA") as used in Example 1 was used in the place of 1.5 g of the absorbent (8) of Example 15.

The body fluid-absorbing article (3) for comparison was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 15. The results are shown in Table 2.

Example 16

A granular absorbent (9) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 3 parts of an aqueous 35% hydrogen peroxide solution by spraying.

A body fluid-absorbing article (16) was obtained by following the procedure of Example 15, excepting the abosrbent (9) was used in the place of the absorbent (8) of Example 15.

The body fluid-absorbing article (16) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 15. The results are shown in Table 2.

Example 17

An absorbent (10) was obtained by mixing 100 parts of the same absorbent polymer as used in Example 1 with 1 part of ethyl gallate

A body fluid-absorbing article (17) was obtained by following the procedure of Example. 15, excepting the absorbent (10) was used in the place of the absorbent (8) of Example 15.

The body fluid-absorbing article (17) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 15 The results are shown in Table 2.

Example 18

An absorbent member was obtained by spary mixing 100 parts of ground pulp with 5 parts of an aqueous 20% sodium hydrogen sulphite, drying the resultant mixture at 80°C for 2 hours thereby producing ground pulp having a sulphur-containing reducing agent deposited thereon, mixing 8 g of the ground pulp with 1 5 g of the same absorbent polymer as used in Example 15 in a current of air, then air moulding the resultant mixture in the same manner as in Example 15, and compressing the resultant sheet-like web with an embossing roller to a density of 0 07 g/cm³

A body fluid-absorbing article (18) was obtained by wrapping the absorbent member with tissue paper and interposing the wrapped absorbent member between one polyethylene film and one polypropylene spun-bond non-woven fabric

The body fluid-absorbing article (18) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 15 The results are shown in Table 2.

Example 19

An absorbent member was obtained by uniformly scattering 1.5 g of the absorbent (1) obtained in Example 1 between two sheets of tissue paper 190 mm × 140 mm in area, pressing the resultant composite with an embossing roller thereby producing an absorbent polymer sheet (1), and superposing two sheets of ground pulp 190 mm × 140 mm in area (having a basis weight of 150 g/m² and a density of 0.1 g/cm³) one each on the opposite sides of the polymer sheet(1)

A body fluid-absorbing article (19) was obtained by interposing the absorbent member between one polyethylene film and one polypropylene spun-bond non-woven fabric

The body fluid-absorbing article (19) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 15. The results are shown in Table 2.

Example 20

Two sheets of tissue paper 190 mm × 140 mm in area (having a basis weight of 20 g/m²) was immersed in an aqueous 0.5% sodium sulphite solution and then dried at 80°C under a vacuum to produce two sheets of tissue paper having a sulphur-containing reducing agent deposited thereon. The amount of sodium sulfite deposited thereon, determined on the basis of one of the immersed sheets of tissue paper, was found to be 0.02 g. An absorbent polymer sheet (2) was obtained by scattering 1.5 g of the same absorbent polymer as used in Example 1 between the two sheets of tissue paper and then compressing the resultant composite with an embossing roller. An absorbent member was obtained by interposing this polymer sheet (2) between two sheets of ground pulp 190 mm × 140 mm in area (having a basis weight of 150 g/m² and a density of 0.1 g/cm³).

A body fluid-absorbing article (20) was obtained by interposing the absorbent member between one

polyethylene film and one polypropylene spun-bond non-woven fabric.

The body fluid-absorbing article (20) was tested for the ability to hold the absorbed adult urine and for the degree of deterioration of the absorbent polymer by following the procedure of Example 15. The results are shown in Table 2.

Table 2

	Body fluid-absorbing article	Amount of adult urine absorbed out (g)	Degree of deterioration of absorbent polymer (Note 1)
Example. 15	Article (15)	2.7	○
Control 3	Article (3) for comparison	10.2	×
Example 16	Article (16)	6.7	△
Example 17	Article (17)	5.5	△
Example 18	Article (18)	3.2	○
Example 19	Article (19)	3.5	○
Example 20	Article (20)	2.9	○

(Note 1) ○ : Perfectly retained shape of swelled gel.
△ : Partially broken shape of swelled gel.
× : Totally broken shape of swelled gel into slurry state.

Claims

1 A body fluid-absorbing article provided with at least one absorbent member comprising 50 to 99% by weight of a fibrous material and 50 to 1% by weight of an absorbent polymer, said absorbent member containing at least one species of compound (A) selected from (i) sulphur-containing reducing agents, (ii) antioxidants and (iii) oxidizing agents

2 An article according to claim 1 wherein said compound (A) is contained in said absorbent member in a ratio falling in the range of 0.05 to 20 parts by weight, based on 100 parts by weight of said absorbent polymer

3 An article according to claim 1 or 2, wherein said compound (A) contains a sulphur-containing reducing agent as an essential component

4 An article according to claim 3 wherein said compound (A) is a sulphur-containing reducing agent

5 An article according to any one of claims 1 to 4 wherein said sulphur-containing reducing agent is at least one member selected from thiosulphates, sulphurous acid, sulphites, hydrogen sulphites dithionites hydrosulphides and mercaptans

6 An article according to any one of claims 1 to 5, wherein said fibrous material is a cellulosic fibre material

7 An article according to any one of claims 1 to 6, wherein said absorbent polymer is at least one member selected from hydrolyzed starch-acrylonitrile graft polymer, partially neutralized starch-acrylic acid graft polymer saponified vinyl acetate-acrylic ester copolymer, hydrolyzed acrylonitrile copolymers, cross-linked hydrolyzed acrylonitrile copolymers, hydrolyzed acrylamide copolymers, cross-linked hydrolyzed acrylamide copolymers, partially neutralized polyacrylic acid, cross-linked partially neutralized polyacrylic acid and isobutylene-maleic anhydride copolymers

8 An article according to claim 7, wherein said absorbent polymer is a cross-linked partially neutralized polyacrylic acid

9. An article according to claim 4, wherein said sulphur-containing reducing agent is at least one member selected from thiosulphates, sulphites, hydrogen sulphites, and mercaptans.

10. An article according to any one of claims 1 to 9, wherein said absorbent member is interposed between a back sheet impervious to body fluid and top sheet pervious to body fluid.

11. An article according to any one of claims 1 to 10, which is a disposable diaper.

12. An article according to any one of claims 1 to 11, wherein said absorbent polymer is used in an amount falling in the range of 40 to 100% by weight, based on 60 to 90% by weight of said fibrous material.

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(54) Body fluid-absorbing article.

(57) A body fluid-absorbing article such as, for example a disposable diaper is provided with at least one absorbent member comprising 50 to 99% by weight of a fibrous material and 50 to 1% by weight of an absorbent polymer, which absorbent member contains at least one compound (A) selected from (i) sulphur-containing reducing agents, (ii) antioxidants and (iii) oxidizing agents. By the action of the compound (A), the swelled gel of the absorbent polymer formed in consequence of absorption of body fluid is prevented from deteriorating or being decomposed by aging

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
E	EP-A-0 249 391 (SEITETSU KAGAKU CO. LTD) * Page 2, lines 5-11; page 5, lines 4-26; page 6, lines 1-26; claims *	1-12	A 61 L 15/00
P,X	PATENT ABSTRACTS OF JAPAN, vol. 12, no. 92 (C-483)[2939], 25th March 1988, page 98 C 483; & JP-A-62 225 507 (MITSUBISHI PETROCHEM CO. LTD) 03-10-1987 * Abstract *	1	
A	DE-A-2 914 386 (ANDERSSON, BROR AXEL ERLING)		
A	GB-A-2 022 505 (COURTAULDS LTD)		

TECHNICAL FIELDS SEARCHED (Int. Cl. 4)

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31-05-1989	ESPINOSA Y CARRETERO M.

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